

NEW YORK CITY DEPARTMENT OF ENVIRONMENTAL PROTECTION
BROOKLYN-QUEENS AQUIFER FEASIBILITY STUDY

CITIZENS ADVISORY COMMITTEE MEETING: May 1, 2003

MINUTES

The twelfth meeting of the Brooklyn-Queens Aquifer (BQA) Feasibility Study Citizens Advisory Committee (CAC) was held on Thursday, May 1, 2003 at the Hillside Manor Comprehensive Care Center. (See Attachment A for Attendance List.)

Helen Neuhaus, Helen Neuhaus & Associates Inc., opened the meeting by welcoming Scientific Review Panel (SRP) members Dr. Leonard Lion (Cornell University), Dr. Gil Hanson (State University of New York at Stony Brook), Dr. James “Chip” Kilduff (Rensselaer Polytechnic Institute), Dr. Jack Caravanos (Hunter College) and Dr. Paul Lioy (Environmental and Occupational Health Sciences Institute). She also welcomed Mark Lenz and Karim Naraghi, Malcolm Pirnie, Inc., and introduced Lillie Farrell, the new Director of Community Outreach for the New York City Department of Environmental Protection’s (NYCDEP) Bureau of Community Outreach and Public Affairs. Following adoption of the Minutes of the April 3rd CAC meeting without changes, Ms. Neuhaus facilitated a brief discussion of follow-up items from that meeting. These included the following:

- As a follow-up to Kenneth Gill’s question regarding drilling activity by the New York City Department of Design and Construction (DDC) in the vicinity of 180th Street and Murdock Avenue, Deputy Commissioner Doug Greeley, NYCDEP, reported that DDC is conducting a seepage basin investigation. This work is not related to the installation of water hydrants in the area.
- NYCDEP has agreed to schedule a second, daytime, tour of its water quality laboratory at Lefrak City for CAC members who missed the first visit. Ms. Neuhaus asked that any interested individuals see her after the meeting regarding the time and date.
- The remaining follow-up items related to materials requested, which were distributed, and the status of negotiations with Con Edison regarding power at the West Side Corporation (WSC) site, which will be discussed later in the agenda.

Referring to the Minutes of the April meeting, Debora Hunte asked if a mechanism exists for detecting bromate, a regulated disinfection by-product that can be formed when ozone reacts with bromide. Bill Yulinsky, NYCDEP, replied that New York City’s drinking water is tested for bromate annually (at a minimum) but could be checked as often as quarterly. Mr. Lenz noted that bromide is naturally occurring in groundwater and changes to bromate only under certain conditions. He added that bromate was not detected in any samples analyzed during the Pilot Plant testing, and would not be formed at the Demonstration Plant because the treatment process and conditions will be the same as those at the Pilot Plant. It was also noted that if bromate were formed, it would be removed by the membrane softening systems. Dr. Lioy suggested that it would be wise to check for bromate during initial operation of the Demonstration Plant. In

response to Dr. Lion's remark that certain parameters, such as perchloroethylene (PCE) or methyl tert-butyl ether (MTBE) require more regular testing, Commissioner Greeley stated that intensive sampling will be conducted during the first year of the Station 6 Demonstration Plant.

Referring to the addendum to the Minutes of the March 6th meeting, Ms. Hunte asked for the location of the sewers being repaired in the Brinkerhoff neighborhood. She added that flooding is still occurring. Commissioner Greeley answered that more than 80 cross connections between catch basins and sanitary sewers have been removed. He noted that while much of the work was physically done outside of the Brinkerhoff community, it was conducted for the benefit of that neighborhood. He added that storm sewers were replaced in the vicinity of 174th Street and Sayres Avenue in order to address localized flooding and that additional locations were identified during a recent meeting with Assemblyman William Scarborough. Commissioner Greeley indicated that as part of its capital improvements program, NYCDEP is looking into the possibility of funding further sewer repair work.

Project Update

Pursuant to his conversation with Andrew English, New York State Department of Environmental Conservation (NYSDEC), Don Cohen, Malcolm Pirnie, Inc., provided information regarding remediation of the WSC site. He reported that all outstanding issues involving Con Edison's provision of power for the project--with the exception of cost--have been resolved. The design work is nearly complete, and the project is ready to go to bid. An agreement has been drafted between the Atlantic Bus Company and NYCDEP allowing the company to park some of its vehicles at the Station 24 site during remediation of the WSC site. Mr. Cohen noted that NYSDEC has also reached a tentative agreement with the property owner that will allow NYSDEC to enter the site for clean-up. In response to a question from Michael Turner, he stated that clean-up of the WSC site is scheduled to start this August or September, adding that the 20% Design Report for the Station 24 wells is expected by mid-May.

Mr. Cohen further reported that analysis of the Station 6 Pilot Plant data is continuing. He remarked that testing of Well 6D, which is the northernmost well on the Station 6 property, has revealed a steady increase in MTBE levels over the past three years. Mr. Cohen noted that although this well is close to the Amoco Gas Station and the Jamaica Bus Depot, the MTBE levels do not coincide with the levels that might be expected from those sites. NYSDEC has identified two gas stations on Merrick Boulevard that might be the source of the contamination: Citgo (at 105th Avenue) and Atlas (at 108th Avenue). Additional information is being requested from NYSDEC.

Linda Hazel asked if the tanks at Amoco and other nearby gas stations had been bunkered. Mr. Cohen answered that a 1998 law required gas stations to document that their storage tanks and leak detection systems have been upgraded. Ms. Hazel and Irving Hicks observed that both the Citgo and Atlas stations are fairly new. However, Mr. Hicks noted that Citgo replaced a Shell station, which was in operation for approximately 20-25 years. Ms. Hazel added that the new library on Guy R. Brewer Boulevard between 108th and 110th Avenues was built on the site of a former gas station.

In response to a question from Ms. Neuhaus regarding the next steps, Mr. Cohen stated that a Freedom of Information Law (FOIL) request was filed with NYSDEC in order to access the agency's records regarding gas station compliance records and other information. He noted that NYSDEC has been very cooperative. Dr. Caravanos suggested that all gas stations in the vicinity of Station 6 be checked. Noting the presence of an auto repair shop in the area, Mr. Turner asked if such a business would have its own tanks. Dr. Caravanos answered that all tanks have to be registered, and Mr. Cohen indicated that it would be worthwhile to investigate this situation.

Dr. Liroy asked about the number of samples containing MTBE and whether the levels had been rising at a steady rate. Mr. Cohen answered that the first samples (collected three to four years ago) showed MTBE levels in the single digits (measured in parts per billion--ppb). A year to 18 months later, concentrations were 70 ppb and by the end of January 2003, concentrations had risen to 340 ppb. Dr. Liroy speculated that this trend could signify a spill or the degradation of an underground tank, with the plume moving toward Well 6D. Expressing his concern, Mr. Cohen stated that none of the data from the monitoring wells between Well 6D and the bus depot show high levels of MTBE contamination; it seems to be "coming from left field." The project team will report back to the Committee after further investigation. Nicole Brown, Malcolm Pirnie, Inc., encouraged CAC members to share any other information they might have about potentially hazardous sites.

Presentation of Station 6 Pilot Treatment Memorandum #4

Mr. Lenz began the presentation by providing a brief recap of the Station 6 Pilot Plant program, including its goal, operations and the results of testing various methods for pH adjustment and iron and manganese oxidation. Referring to PowerPoint slides (see Attachment B), he described the results of membrane filtration testing.

Membrane filtration, which removes oxidized manganese and iron using the same concept as a coffee filter, involves a physical, rather than a chemical or biological, process. Two types of filtration were tested: microfiltration and ultrafiltration. Mr. Lenz explained that filtration works by pushing or pulling unfiltered water through a membrane. Any iron or manganese particle larger than the pore size is trapped on the "dirty" side of the membrane, while the filtered water flows out the other side. Every twenty to thirty minutes, the accumulated solids on the filters are cleaned through a process called "backwashing," during which the filtered water runs in a reverse direction, rinsing the dirty side of the filter. Observing that the filters are like very small straws, or strands, Mr. Lenz stated that there are millions of strands in each filtration unit.

Discussing the test results, Mr. Lenz first noted that the goal is to reduce iron and manganese levels below federal and state standards (0.3 milligrams per liter (mg/L) for iron and 0.05 mg/L for manganese). Tests were performed using filtration units manufactured by three companies: Pall, Zenon, and Ionics. Referring to a series of graphs illustrating the test results, Mr. Lenz stated that the filtered water samples show iron levels of 0.1 mg/L. He explained that the levels are actually even lower. However, the laboratory method used was not able to measure below 0.1 mg/L. Mr. Lenz noted that the overall test results for manganese indicate levels well below 0.05 mg/L. He explained that the few instances that show manganese above that level represent pilot-scale problems with the upstream oxidation, not the filters. Dr. Liroy expressed his opinion

that the graphs for iron should show the exact number or at least indicate that the levels were below 0.1 mg/L. In response to a question from Dr. Kilduff, Mr. Lenz indicated that all samples showed very low turbidity.

Mr. Lenz then discussed the factors that must be considered when selecting a filtration unit for the Demonstration Plant. These are:

- Flux: the amount of flow through a given area of membrane (measured in gallons per square foot per day). This is important because the flux rate influences the amount of floor space a unit will require.
- Recovery: the volume of water remaining after filtration and backwashing. Mr. Lenz noted that the Pilot Plant had a target goal of 90% recovery; a target goal of 97% will be used for the Demonstration Plant.
- Pressure: the amount of force needed to push water through the membrane (measured in pounds per square inch). Mr. Lenz explained that even with backwashing, iron and manganese will build up on the membrane surface over time, and additional pressure will be needed to push water through the filter. He noted that every membrane system has a pressure threshold. When the threshold is exceeded, the system automatically shuts down and thorough cleaning is required. In response to a question from Dr. Carvanos, Mr. Lenz stressed that when the system shuts down, unfiltered water is not released into the water supply. He added that the higher the pressure, the bigger the pump, which translates into higher energy use, cost and maintenance, all of which must be taken into account.

In response to a question from Peter Richards, Mr. Lenz explained that individual filter modules are taken off line for “enhanced backwashing” one to three times per day. This process usually involves hydrochloric acid and/or hydrogen peroxide along with water to clean the filters. Since the system is off line, no chemicals enter the water supply. In response to questions from Ms. Hazel and Denise Woodin, Mr. Lenz explained that since there will be hundreds of filtration units at the Demonstration Plant, overall operations will not be affected when one is taken off line for cleaning.

- Permeability: the amount of water that can be pushed or pulled through the filter at any given time. Permeability dictates how efficient the system will be: high permeability results in more output with less stress on the system and lower energy costs. Mr. Lenz noted that permeability decreases over time.

Mr. Lenz stated that a significant amount of data was collected at the Pilot Plant. This data will be plugged into models, which will be discussed with the three manufacturers. Answering questions from Mr. Gill and Dr. Carvanos, Mr. Lenz indicated that all of the companies have extensive, demonstrated experience in producing membrane filtration systems for large water treatment projects. For example, Zenon has a plant in Massachusetts; Ionics was chosen for a Minneapolis surface water filtration plant that is the biggest facility in the country; and Pall has a plant in Texas that filters groundwater. Mr. Gill asked how the contract will be awarded. In response, Mr. Lenz outlined the next steps, which include engineering analysis (i.e. design

considerations, membrane costs, footprint/sizing, the complexity of operation and maintenance, and life cycle cost) and preliminary design. Observing that the rate of build-up on the membrane filter depends on pressure, Dr. Kilduff asked if manufacturers are aware of their competitors' designs. Mr. Lenz replied that they are very aware of each other and like to compete on the basis of life-cycle cost.

In a lengthy discussion of membrane replacement, the following comments and questions were noted:

- Mr. Turner asked if the membranes would need replacement, and if so, how often. Mr. Lenz replied that replacement of the membranes would be factored into the life cycle cost and that a 7-year warranty would be requested. (He noted that some membranes can last ten years.)
- Mr. Lenz also explained that constant technological improvements make it beneficial to replace membranes over time. After Dr. Caravanos expressed his opinion that membranes will continue to improve, Mr. Lenz stated that only the membrane module, not the entire system, would need replacement.
- In response to a follow-up question from Mr. Richards, Mr. Lenz noted that the membranes are designed not to break. Although one or two of the strands (out of millions) may break, the system is set up to detect and isolate the damage. Mr. Yulinsky added that even if a small amount of iron or manganese slipped through a damaged membrane, it would not be enough to pollute the water supply.
- In response to a question from Dr. Lion, Mr. Naraghi indicated that each membrane unit experienced a break during the pilot testing but that such an occurrence was normal and easily corrected.
- During the one-year operation of the Pilot Plant, several performance tests were conducted to determine if the system would function at the same level for 30 days. Jeff Diggs observed that he now sees the value of the pilot program; if elements of the system break down, the team can learn how to deal with the problem.
- Answering a question from Ms. Hazel, Mr. Lenz stated that the membranes are made of "relatively rugged", oxidant-resistant plastic. Dr. Caravanos asked about the diameter of the membrane; Mr. Naraghi stated that he would provide that information.

Ms. Neuhaus announced that next month's agenda will focus on the last Pilot Treatment Memorandum in the series, which addresses the use of nanofiltration and reverse osmosis to soften the water and remove dissolved particles.

Discussion of Health Presentation

Ms. Neuhaus asked the CAC to consider topics for a future presentation relating to health issues. During the extended discussion that ensued, the following suggestions and comments were expressed:

- Ms. Hazel listed nitrates, sodium and calcium/magnesium ratios in drinking water as concerns. She indicated the need for additional research regarding hypertension and diabetes in the black community and also requested assistance from the SRP with the neighborhood cancer study.
- Following up on Ms. Hazel's comments, Mr. Richards stated that communities most at risk should be targeted for the study. He expressed his concern regarding outreach to these communities and emphasized the need to educate children. In response, Ms. Neuhaus noted that NYCDEP and CAC members are working with the schools to provide hands-on activities related to health and science issues. She indicated that one of the goals of the Demonstration Plant will be community education. Commissioner Greeley commented that although the New York City Board of Education is being re-organized, the project team hopes to be able to continue working with Karleen Comrie, the District's Science Coordinator.
- Mr. Hicks suggested a discussion of the long-range potential hazards of exposure (through air or soil) to PCE.
- Ms. Hunte recommended a case study of the side effects, if any, of the chemicals being considered for use at the Demonstration Plant.
- In response to Dr. Caravanos' question regarding the forum for presenting information, Mr. Diggs suggested an informational town hall meeting at which various experts could make presentations. Answering Ms. Neuhaus' question about the difference between such a forum and the town hall meetings held by elected officials, Mr. Diggs stated that the focus would be on a community-selected panel, rather than city agencies. Mr. Diggs and Ms. Hazel noted that the presentation could be videotaped for Queens Public Access Television and other venues. Dr. Lioy commented that a special organizing meeting to discuss objectives and the potential audience might be helpful. Mr. Gill recommended that small meetings be held initially, in order to "see what's bothering people."
- Commissioner Greeley observed that many topics could be covered in a continuing series of presentations. He suggested that the first focus on water supply and diet.
- A lengthy discussion followed regarding the need to address a lack of public confidence in the New York City drinking water system. Mr. Gill noted that the water in southeast Queens has come from different sources than the water supplied to the rest of the city. This, and past problems with the Jamaica Water Supply Company, has led to suspicion and mistrust. In response to Mr. Turner's comment regarding the importance of getting information out to the public, Ms. Neuhaus offered the following ideas: 1) The CAC should reach out to its constituent groups; 2) an executive summary of the Treatment Memoranda should be distributed to the CAC and the public; and 3) a public forum should be scheduled for the early fall. The CAC then agreed that the health presentation should be placed on the "back burner" and that there should be greater emphasis on getting information about the project out to the public. Ms. Neuhaus suggested that newsletters might go out more frequently now that data is available.

Ms. Hunte expressed her opinion that the community's sewer and flooding concerns are as important as, and are tied to, the Station 6 and 24 wells. She urged the team to continue to address the sewer issue. Ms. Neuhaus noted that the focus of the project is Station 6, water quality and the relationship of the WSC to pumping at Station 6. It was also noted that Commissioner Greeley is continuing to address sewer concerns in the area.

The next CAC meeting is scheduled for **Thursday, June 5th at 7 p.m.** at the Hillside Manor Comprehensive Care Center, 188-11 Hillside Avenue, Jamaica Estates.

Follow-up Items

1. Indicate frequency (i.e., quarterly, annually) that bromide/bromate is/will be tested. Responsibility: Bill Yulinsky, DEP.
2. Investigate status of capital project, in vicinity of 112th Avenue, particularly work related to determining street elevations, to assess feasibility of installing storm sewers. Responsibility: DEP.
3. Determine when library on Guy R. Brewer Boulevard, which was built on the site of a former gas station, was constructed. Responsibility: DEP, Malcolm Pirnie, HNA, CAC.
4. Provide update at June meeting on research being done to determine source of elevated levels of MTBE detected in Well 6D. Responsibility: Don Cohen, Malcolm Pirnie.
5. Consider Dr. Paul Liroy's suggestion that the chart "Filtered Water Quality" shown in the PowerPoint presentation be revised. Dr. Liroy noted that currently, all samples are shown with an iron concentration of 0.10 mg/L, the detection limit, even though the actual levels are predicted to be considerably lower. Responsibility: Malcolm Pirnie.
6. Determine the cross-section diameter of the membrane filter (Dr. Jack Caravanos). Responsibility: Malcolm Pirnie.
7. Continue to consider future health presentation (possible topics, purpose of forum, format, schedule, etc.). Responsibility: DEP, Malcolm Pirnie, HNA, SRP, CAC.
8. Prepare Executive Summary of five (5) Pilot Treatment Memoranda for distribution to CAC. Responsibility: Malcolm Pirnie, HNA, DEP.
9. Prepare project newsletter for distribution to community. Responsibility: HNA, Malcolm Pirnie, DEP.

Brooklyn-Queens Aquifer Feasibility Study
Citizens Advisory Committee
Thursday, May 1, 2003

Attendance List

CAC Members/Alternates

Linda Caleb Hazel
A Better Day Inc./St. Benedict The Moor/
St. Bonaventure

Jeff Diggs
Councilman Leroy Comrie

Kenneth Gill
Addisleigh Park Civic Association

Richard Hellenbrecht
Community Board #13

Irving Hicks
Brinkerhoff Action Association

Debora Hunte
Brinkerhoff Action Association

Peter Richards
Community Board #13

Michael Turner
Addisleigh Park Civic Association

Guests

Sarah Hicks
Resident

Maurice R. Muir
Community Board #12

Media

Courtney Dentch
Jamaica Times

Dan Hendricks
Queens Chronicle

Scientific Review Panel

Jack Caravanos
Hunter College

Gilbert Hanson
State University of New York at Stony Brook

James "Chip" Kilduff
Rensselaer Polytechnic Institute

Leonard Lion
Cornell University

Paul Lioy
Environmental and Occupational Health
Sciences Institute

Project Team

Nicole Brown
Malcolm Pirnie, Inc.

Don Cohen
Malcolm Pirnie, Inc.

Lillie Farrell
New York City Department of
Environmental Protection

Doug Greeley
New York City Department of
Environmental Protection

Natasha Harper
New York City Department of
Environmental Protection

Mark Lenz
Malcolm Pirnie, Inc.

Karim Naraghi
Malcolm Pirnie, Inc.

Helen Neuhaus
Helen Neuhaus & Associates Inc.

Denise Woodin
Helen Neuhaus & Associates Inc.

Anita Wright
Helen Neuhaus & Associates Inc.

Bill Yulinsky
New York City Department of
Environmental Protection

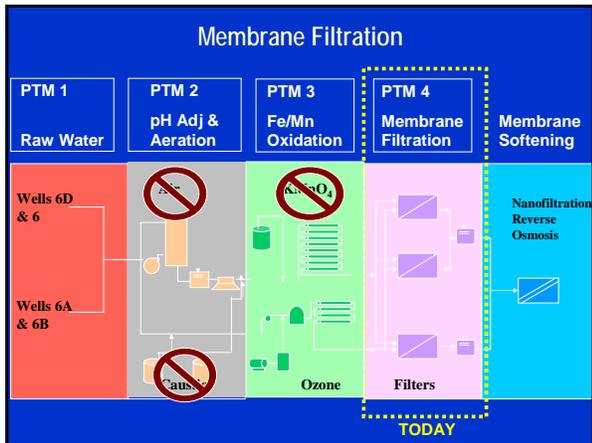


Outline

- Brief Background/Recap – Station 6 Pilot Test Program
- Pilot Testing Results
 - o Membrane Filtration – for Iron and Manganese Removal ----- **IT WORKS!**

Goal

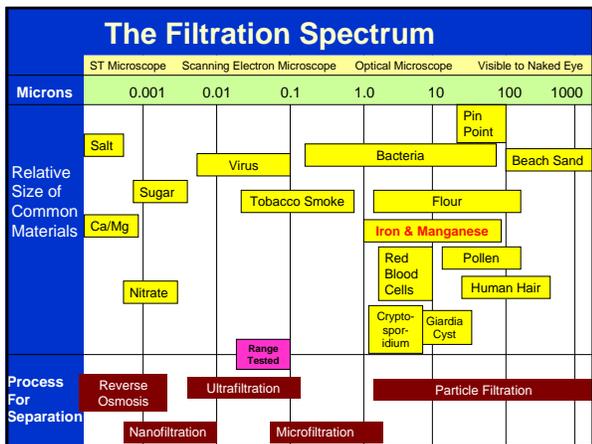
Evaluate Treatment Processes to ensure that Station 6 Demonstration Plant provides drinking water of the highest quality.



Pilot Testing Results Membrane Filtration

What is Membrane Filtration?

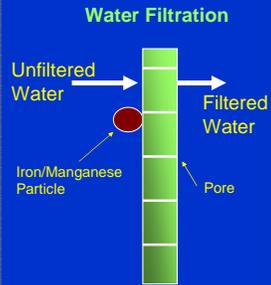
- A physical removal mechanism
- A filter traps solids that are larger than its pore size
- Tested two types:
 - Microfiltration (MF)
 - Ultrafiltration (UF)



Pilot Testing Results Membrane Filtration

Membrane Filtration: How Does it Work?

1. Unfiltered Water is pushed/pulled against membrane.
2. Anything larger than pore size (i.e. iron & manganese particles) are trapped on "dirty" side of filter.
3. Filtered water flows out.

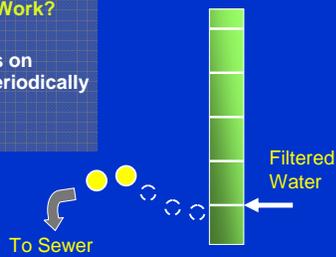


Pilot Testing Results Membrane Filtration

Membrane Filtration: How Does it Work?

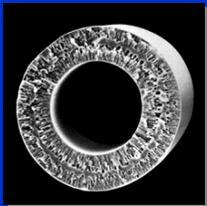
Accumulated solids on filters need to be periodically cleaned.

Backwashing



Pilot Testing Results Membrane Filtration

Membrane Filtration: How Does it Work?



Cross-Section of Hollow
Fiber Membrane



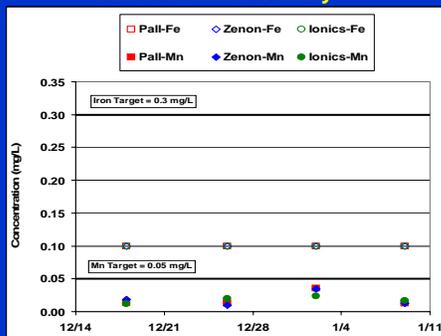
Membrane Canister

Pilot Testing Results Membrane Filtration

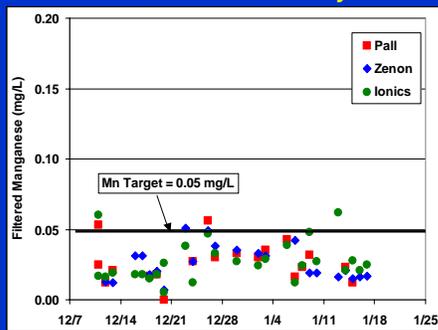
Membrane Filtration – How do we measure *how well* it is working?

- **Water Quality** - Does filtered water meet (or exceed) the State and Federal Drinking Water Standards?
 - Iron - 0.3 mg/L
 - Manganese - 0.05 mg/L

Pilot Testing Results Membrane Filtration with Ozone Oxidation Filtered Water Quality



Pilot Testing Results Membrane Filtration with Ozone Oxidation Filtered Water Quality



Pilot Testing Results

Membrane Filtration with Ozone Oxidation

It Works!

All systems meet drinking water standard for Fe/Mn Removal

What else do we need to know?

- Flux → How much floor space?
- Recovery → How much water?
- Pressure → How much force?
- Permeability → How efficient?

Pilot Testing Results

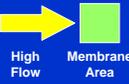
Membrane Filtration

What else do we need to know?

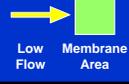
Flux → **How much floor space?**

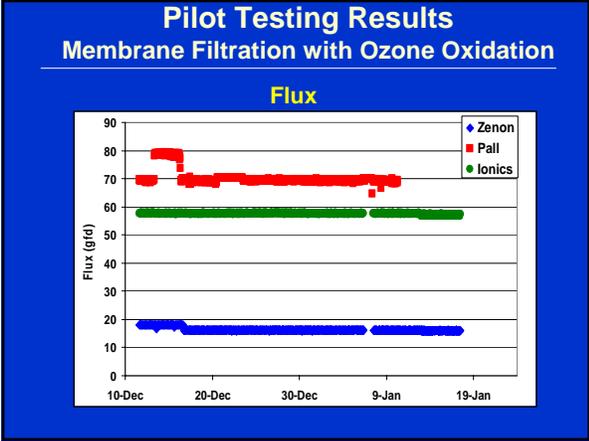
- Amount of Flow through a given area of membrane
- Gallons per square foot per day (gfd)
- Why? - Floor Space

High Flux



Low Flux





Pilot Testing Results Membrane Filtration

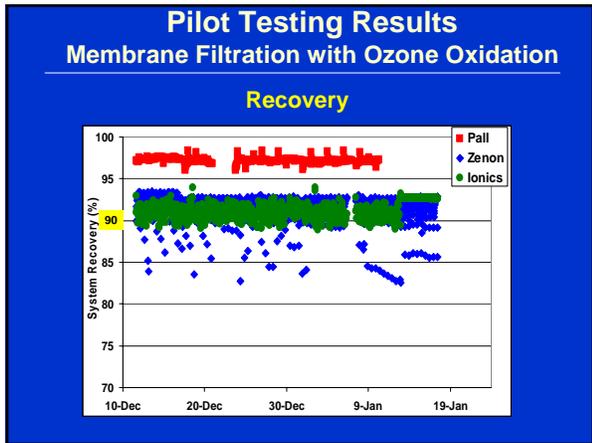
What else do we need to know?

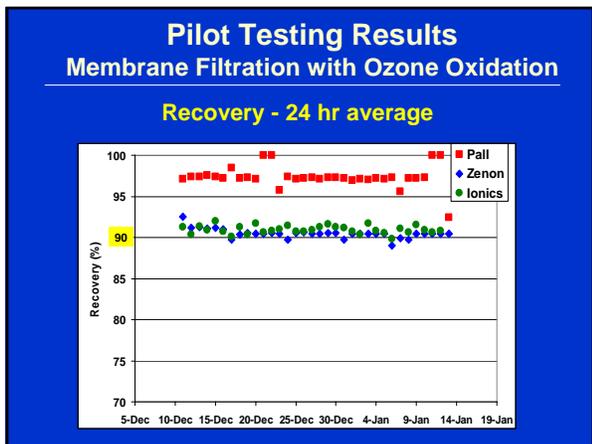
Recovery → How much water?

- Input vs. Output
- Volume of water and time lost in backwash & cleaning
- Higher values are better
- 90% target recovery

High Recovery
Membrane

Low Recovery
Membrane





Pilot Testing Results Membrane Filtration

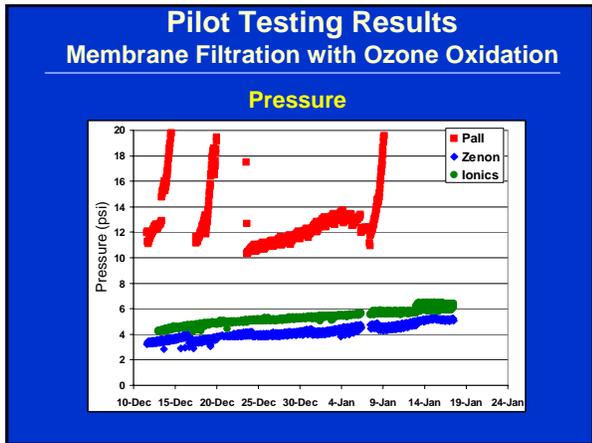
What else do we need to know?

Pressure → **How much force?**

- Force needed to push water through membrane
- Pounds per square inch (psi)
- Why?
 - Power
 - Operation & Maintenance
 - Cost

High Pressure

Low Pressure

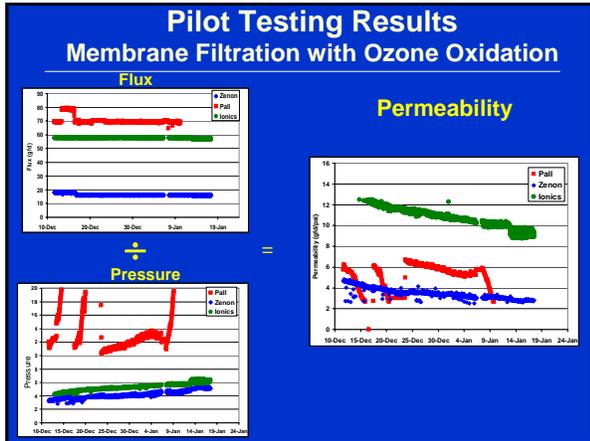


Pilot Testing Results Membrane Filtration

What else do we need to know?

Permeability → **How efficient?**

- Flux ÷ Pressure - 'levels the playing field'
- Higher permeability is better
- Why?
 - More output with less stress on the system



Pilot Testing Results Membrane Filtration with Ozone Oxidation

Overall Summary

- Membrane filtration met water quality targets
IT WORKS !!
- Data collected during the pilot testing will be used to analyze and design Demonstration Plant.

Pilot Testing Results Membrane Filtration

Next Steps (I.e. Our Homework)

- Engineering Analyses
 - o Design considerations
 - o Membrane costs
 - o Actual footprint/sizing
 - o Complexity of operation and maintenance
 - o Life-cycle cost
- Preliminary Design Process

